SHOCK METAMORPHISM ON BADDELEYITE: IMPLICATION FOR U-Pb ISOTOPIC SYSTEMATICS OF SHERGOTTITES. T. Niihara[1], H. Kaiden[1,2], K. Misawa[1,2], and T. Sekine[3], [1]The Graduate University for Advanced Studies, Tachikawa, Tokyo 190-8518, Japan. E-mail: niihara@nipr.ac.jp, [2]Antarctic Meteorite Research Center, NIPR, Tachikawa, Tokyo 190-8518, Japan, [3]National Institute for Materials Science, Tsukuba, Ibaraki 305-0044, Japan.

Introduction: The age significance of isotope chronometers in basaltic shergottites is not agreed yet [1-3]. Bouvier et al. [3] argued that crystallization ages of shergottites were old (~4.1 Ga), and suggested that young ages of shergottites (i.e., ~180 Ma) represent reset by shock metamorphism. Baddeleyite (ZrO_2) is an important mineral for U-Pb dating of basaltic shergottites. By compression, monoclinic baddeleyite shows sequential transition to two orthorhombic phases up to 70 GPa [4]. Shock recovery experiments on baddeleyite were performed at the shock pressures of 24, 34, 47 and 57 GPa using a propellant gun at NIMS [5], to understand the shock effects on baddeleyite.

Samples and Analytical Techniques: We used coarse-grained baddeleyite from Phalaborwa, South Africa, (2059.8 Ma) as a starting material. The baddeleyite is mixed with a coarse-grained basalt from North Kona, Hawaii [6] with a weight ratio of 1:2. In situ U-Th-Pb isotopic analysis of shocked baddeleyite was carried out with the SHRIMP II at NIPR [7].

U-Pb Isotopic Systematics: There is no correlation between shock pressures and degrees of U-Pb discordancy. Lead loss from baddeleyite was observed for none of the experimentally shocked samples. In addition, the U-Pb and ^{207}Pb-^{206}Pb ages of shocked baddeleyites are indistinguishable from those of starting baddeleyite within errors.

Discussion: U-Pb and ^{207}Pb-^{206}Pb systematics of naturally shocked eucritic zircon and experimentally shocked zircon were not disturbed by shock metamorphism [7,8].

There are no published experimental data for the effect of Pb or U diffusion in baddeleyite. If the U-Pb systematics of shergottites were disturbed at the time of shock metamorphism as Bouvier et al. [3] suggested, it means that the Pb diffusion in baddeleyite is faster than that in zircon. A knowledge of diffusivites of Pb or U in baddeleyite is needed for further discussion.

Although our shock experiments are different in temperature, duration of peak shock pressure, and grain size from shergottites, it is possible that the U-Pb system of baddeleyite is not disturbed by shock metamorphism.

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